1.3. Samoa

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1.3.1. Operations

There was a personnel change at the observatory during the year. The SMO station chief ended a 4-year term and went to a teaching position at the American Samoa Community College. The electronic technician was then installed as station chief and an environmental engineer was hired.

The most exciting and disturbing event of the year was the burglary of the main observatory building. A safe that contained money and paper work was stolen. The perpetrators were caught, but none of the stolen property was recovered. A new safe was cemented into the floor of the office. Some structural changes were also made to the building to improve security.

Two hurricanes made close calls early in the year. Minor damage was incurred and was easily repaired by station personnel. These storms were a reminder of the past few years when two hurricanes did extensive damage.

The two observatory vehicles were a constant source of trouble throughout the year. Both the van and the truck neared 100,000 miles of use. Repairs became more frequent and more complex, greatly inconveniencing the staff. Toward the end of the year the process began to replace the truck.

The backup generator logged many hours during power blackouts. One major breakdown occurred but was successfully repaired by the staff. A modification was made to prevent overheating becaue of water loss in the radiator; when the generator overheated once before, the result was a $12,000 overhaul.

Major remodeling of house T-7 occurred once the environmental engineer and family moved in. They did all the work themselves and greatly improved the appearance of the place. Unfortunately, a few termites were seen. Poison was applied in an effort to kill the termites, but this measure has not always been successful in the past.

1.3.2. Programs

Table 1.5 summarizes the programs at SMO for 1993. Further descriptions of some of the programs follow.

Carbon Dioxide

The continuous CO_2 analyzer ran faithfully through the year with only one short period of downtime. Data quality was very high.

The most difficult task of the year was to replace the sample lines that run up the side of the 18-m mast. The wind-induced vibrations in the Dekoron tubing caused cracks and eventually breakage in several places. With the use of climbing gear, the station chief replaced all four lines that extended to the top of the mast. Further restraint was added to the lines to reduce vibration and hopefully prevent future problems of this sort.

The glass fittings on the through-analyzer flask filling apparatus were replaced with Teflon fittings.

A by-pass valve was added to the no. 2 air line upstream of the analyzer. The valve will be open for about an hour every 2 weeks for filling flasks for two cooperative projects. One set of flasks will come from SIO and the other from URI.

Surface Ozone

The Dasibi ozone monitor was down for several months when it became lost in the mail on its way in for repairs. A replacement Dasibi was installed toward the end of the year and worked well after overcoming a small difficulty. The new monitor had water condensation inside the intake line and in the instrument causing erratic output. To take care of this problem, the intake line was insulated and warmed with heat tape to prevent condensation.

The data recorded by CAMS was frequently interrupted because of the sensitive nature of the signal-receiver board. This problem was due to the lack of reliable power for CAMS. Some improvement was made when a power connection was made to the UPS in the Ekto building.

Total Ozone

The Dobson ran well. The instrument was sent to Hawaii for 2 weeks of intercomparison calibration. When the Dobson was returned, a member of the Aerosols, Radiation, Ozone, and Water Vapor Division installed a digital encoder. The encoder is connected to a computer that records the r-dial numbers and calculates the total ozone. This improved setup has relieved the staff of the tedious process of writing the data on paper forms.

Halocarbons and Nitrous Oxide

When operating properly, the dual GC system produces reliable data. There was one small problem and one big problem to contend with during the year. One of the ECD's went bad and had to be replaced, but the old one had to be sent back first. Once the replacement arrived, a successful installation was made quickly with little difficulty.

Computer hang-ups were a far more perplexing problem. In the beginning of the year the system was running day after day with virtually no down time (this can be credited to the previous installation of a UPS). The computer then started to hang-up for no apparent reason. The suspected cause for the malfunction was replaced but this didn't help much. The hard drive was reformatted and the programs reinstalled, again this didn't help. At year's end, it was almost a daily ritual to reboot the stalled system.

Aerosols

After a period of good side-by-side comparison between the TSI and GE, the GE was retired. The TSI performed well with only a few small problems. The Pollak counter also worked reliably throughout the year.

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TABLE 1.5. Summary of Measurement Programs at SMO in 1993

Program	Instrument	Sampling Frequency
Gases		
CO_2	Siemens Ultramat-5E analyzer	Continuous
CO_2, CH_4	0.5-L glass flasks, through analyzer	1 pair wk^{-1}
	2.5-L glass flasks, MAKS pump unit	1 pair wk^{-1}
Surface O_3	Dasibi ozone meter	Continuous
Total O_3	Dobson spectrophotometer no. 42	4 day^{-1}
N_2O, CFC-11, CFC-12, CFC-113, CH_3CCl_3, CCl_4	300-mL stainless steel flasks	1 sample wk^{-1}
N_2O, CFC-11, CFC-12, CFC-113, CH_3CCl_3, CCl_4, HCFC-22, HCFC-141b, HCFC-142b, CH_3Br, CH_3Cl, CH_2Cl_2, $CHCl_3$, C_2HCl_3, C_2Cl_4, H-1301, H-1211	850-mL stainless steel flasks	1 sample mo^{-1}
CFC-11, CFC-12, CFC-113, N_2O, CCl_4, CH_3CCl_3	HP5890 automated GC	1 sample h^{-1}
N_2O	Shimadzu automated GC	1 sample h^{-1}
Aerosols		
Condensation nuclei	Pollak CNC	1 day^{-1}
	G.E. CNC	Continuous
	TSI CNC	Continuous
Solar Radiation		
Global irradiance	Eppley pyranometers with Q and RG8 filters	Continuous
Direct irradiance	Eppley pyrheliometer with Q filter	Continuous
	Eppley pyrheliometer with Q, OG1, RG2, and RG8 filters	Discrete
Meteorology		
Air temperature	Thermistors (2)	Continuous
	Max.-min. thermometers	1 day^{-1}
Dewpoint temperature	Polished mirror	Continuous
Pressure	Capacitance transducer	Continuous
	Mercurial barometer	1 wk^{-1}
Wind (speed and direction)	Bendix Aerovane	Continuous
Precipitation	Rain gauge, tipping bucket	Continuous
	Rain gauge, plastic bulk	1 day^{-1}
Precipitation Chemistry		
Anions (NO_3^-, $SO_4^=$)	Dionex QIC ion chromatograph	1 day^{-1} (CMDL)
Cooperative Programs		
CO_2, ^{13}C, N_2O (SIO)	5-L evacuated glass flasks	1 set wk^{-1} (3 flasks set^{-1})
GAGE project: CFC-11, CFC-12, N_2O, CH_3CCl_3, CCl_4 (SIO)	HP5880 gas chromatograph	1 h^{-1}
Various trace gases (OGIST)	Stainless steel flasks	1 set wk^{-1} (3 flasks set^{-1})
Bulk deposition (EML)	Plastic bucket	Continuous (1 bucket mo^{-1})
Hi-vol sampler (EML)	High-volume sampler	Continuous (1 filter wk^{-1})
Hi-vol sampler (SEASPAN Project)	High-volume sampler	Continuous (1 filter wk^{-1})
CH_4,($^{13}C/^{12}C$ ratio) (Univ. of Wash.)	30-L pressurized cylinder	Biweekly
Light hydrocarbons (UCI)	1-L evacuated stainless steel flasks	3-4 flasks qtr^{-1}
O_2 (URI)	2.5-L glass flasks	2 pair mo^{-1}
O_2 (SIO)	3-L glass flasks	2 sets mo^{-1} (3 flasks set^{-1})

Water condensed inside the TSI and displaced the alcohol. This was remedied by pouring out the liquid and filling the instrument with pure butanol.

The ammeter connected to the Pollak had to be replaced when the needle began to respond sluggishly. Other than that, the Pollak had a good year as usual.

Solar Radiation

The solar radiation instruments are usually very dependable and this year was no exception. The only problem was a leak in the seal around the dome of the Q-pyranometer. In an attempt to pinpoint the leak, a little air pressure was applied to the instrument; a little too much air pressure was used and the whole dome popped off. Since there was no damage to the dome, it was reattached and put back into service leak free.

Meteorology

Everything went well for the meteorological system during the year. However, two occurrences deserve mention. (1) The wind speed reported by the Aerovane was too low. After verifying the integrity of the electronics, a new Aerovane was installed and tested. From then on, the wind-speed indications were reliable. (2) When the registered dewpoint temperatures indicated below-zero readings, the mirror assembly was replaced and the problem solved.

CAMS

For the most part, CAMS did its job of collecting data. The early part of the year was marked by several interruptions because of power problems that resulted in board failures inside the MO3 and ASR CAMS units. This problem was relieved by upgrading the 182-m (600-ft) extension cord that connected the CAMS units to the UPS in the Ekto building. Even after this improvement, all the CAMS units still experienced occasional auto-restarts but these were few and far apart.

Cooperative Programs

The SIO GC produced consistent data during the year. The ignitor in the FID failed and had to be replaced. This fairly delicate operation was performed successfully with only a very short period of interruption in the data. The UPS kept the system going continuously by protecting the equipment from the unreliable power supplied locally. To ensure continued UPS operation, a fresh set of batteries was installed.

The SEASPAN system is another one of those projects that rarely has a problem, but during this year, the big, heavy blower had to be swapped out two times. There was a spare on hand the first time so there was very little down time, but the second time the replacement had to be shipped. This resulted in several months of down time.

Two new cooperative flask programs were added during the year. One is for SIO and the other for URI.